

knowledge of the fundamental facts has now become sufficiently definite to justify the step, Dr. McClung has arranged a series of experiments designed to give a practical knowledge of the methods employed and the results obtained in these newer developments of electrical science. The description of the book as a text-book with experiments indicates the plan on which it is written. A connected account of the subjects considered is given from an experimental point of view, with descriptions and diagrams of suitable apparatus by means of which students may perform the experiments and test the results stated, without unnecessary complications. Thus the book provides a convenient summary of the results of recent researches, and is not a volume for the laboratory only.

The book is divided into two parts; chapters i.-vii. deal with electric discharges through gases, and chapters viii.-xvi. with radio-activity. In part i. accounts of cathode and Röntgen rays and a sketch of the ionisation theory are given, while descriptions of a few experiments on ionisation by ultra-violet light and by incandescent solids are added. We commend to the notice of those beginning research in this department the valuable chapter on the apparatus and instruments used in the investigations. The practical hints on the manipulation of electrometers and electroscopes, given by an experienced worker, cannot fail to be helpful. In part ii. experiments on the radiations and emanations from radio-active substances, on induced activity, and on the radio-activity of the atmosphere are described, and a sketch of the disintegration theory is added. A list of 125 experiments is given at the beginning of the book; the author suggests that the more difficult experiments, of which twenty are indicated, may be reserved by the student for a later stage.

We think that students contemplating research in these branches of physics would find the course a valuable preparation for their work. From the nature of the experiments, however, it will be evident that most of them could be undertaken profitably only by those who, as a result of their previous experience of practical work in electricity, have acquired considerable skill in manipulation; for it would be useless to set a student who was unable to manage a galvanometer to struggle with the difficulties of an electrometer. To set up the apparatus and perform the whole of the experiments would require a considerable time; but a student who worked through even a small number of experiments selected from the list would gain a valuable insight into the methods of investigation in use in this part of the subject. The provision, *for purposes of instruction*, of the apparatus which is necessary would, we fear, form a difficulty in some physical laboratories, and, paradoxical as it may seem, not least in those in which researches dealing with the subjects of the book are in full progress.

A few of the definitions in the theoretical sections require more careful statement, and the remarks on the law of decay at the end of chapter xii. need revision. The book is also capable of considerable improvement in literary style.

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TWO BIOLOGICAL TREATISES.

- (1) *Die Selektionstheorie.* Eine Untersuchung von August Weismann. Pp. vi+69. (Jena: Gustav Fischer, 1909.) Price 2 marks.
- (2) *Experimentelle Studien zur Soma- und Geschlechts-Differenzierung.* Erster Beitrag. Von Prof. Johannes Meisenheimer. Pp. vii+149. (Jena: Gustav Fischer, 1909.) Price 6.50 marks.

(1) **A**MONG the most welcome effects of the Darwin commemoration held last year at Cambridge has been the reappearance of Prof. Weismann in the lists as a champion of the doctrine of natural selection, a cause which for the last fifty years he has never ceased to defend with the whole weight of his authority and learning. But for the invitation from Cambridge to contribute to the memorial volume published on that occasion, the veteran professor, as he informs us in the preface to his "Selektionstheorie," would scarcely have undertaken to add anything to his former writings on the subject. Now, however, he has not only enriched the Cambridge "Festschrift" with the English essay in which his views are so admirably stated, but he has published the same treatise in German, substantially unaltered, but with the addition of certain passages in which his conclusions on the subject of the reality of the selection-process are driven home with fresh force and cogency.

In this production Weismann's dialectical ability and literary skill shine out as conspicuously as ever; and it would be difficult to find, within the same compass, an equally convincing presentation of the case for Darwin's conception of the action of natural selection in the formation of species, or one more aptly illustrated by examples drawn from many departments of organic nature. While so much continues to be written which tends to overcloud and confuse the simplicity of the Darwinian position, it is refreshing to see how Weismann goes straight to the point, brushing aside those objections that proceed from imperfect appreciation of the facts to be explained, and quietly putting in their proper place, as subordinate to the selection-theory, certain well-attested phenomena which have in some quarters been supposed to be hostile to Darwinian interpretations. All this is done with the utmost candour and courtesy, and without the least trace of arrogance or contempt for adverse opinion. In full agreement with both Darwin and Wallace, Weismann here holds, as he has always done, that adaptation is a universal principle in the world of life, and that of this principle selection affords the one and only possible explanation. After reading the masterly defence of the position to be found on pp. 48-69 of the present treatise, those younger biologists who may have allowed themselves to be troubled with doubts as to whether, after all, the theory of adaptation by selection has not been overdone may well take fresh courage and renew their confidence in Darwin's solution of the teleological problem.

Sexual selection, to which Darwin attached much importance, has been vigorously attacked from many

quarters. Some of the staunchest upholders of natural selection, including Wallace himself, look askance at the theory which seeks to explain certain features of colouring and other ornamentation in male animals as the result of female preference. Here also Weismann ranges himself unhesitatingly on the side of Darwin. Sexual selection is to him a real and active transforming force, as demonstrable as natural selection itself, and passing into the latter by an easy transition. A specially interesting section of the present essay deals with the scent-producing organs of male Lepidoptera, the perfume distributed from which is now known in very many cases to be as agreeable to the human perception as it presumably is to that of its possessors or their mates. Weismann's own ancillary theory of germinal selection, suggested to some extent by Roux's conception of the "struggle of parts," is here lucidly expounded. Whether the theory be accepted or not—and many, it must be admitted, have found it unconvincing—there is no doubt that it would account for many facts at present not easy of explanation.

(2) The second treatise is of a different character. It contains a detailed account of elaborate experiments on the removal and transplantation of the primary sexual organs in the larva of *Lymantria dispar*, commonly known as the "gipsy-moth." Meisenheimer has succeeded, by the help of the galvanic cautery, in destroying the reproductive glands in larvæ of both sexes at various periods of growth, beginning with the earliest stage after emergence from the egg. In partly-grown larvæ he has been able to transplant the male primary reproductive organs into the body of a female, and *vice versa*. As principal results of his experiments he considers himself to have proved the inability of the reproductive organs, as distinct from mere sex-characters, for regeneration; and also the absence of any formative stimulus for secondary sex-characters, emanating from the primary sex-organs themselves. A transplanted ovary is shown to have no impeding effect on the development of the male reproductive apparatus, while the ovary itself can reach its fully mature condition when artificially inserted into the body of the male. The regeneration of sex-characters, where this takes place, is entirely unaffected by the absence of the primary sex-organs of the individual concerned, or by the presence of those of the opposite sex. The conditions obtaining in hermaphrodites naturally occurring among the Articulata are similarly adverse to the theory of a special formative stimulus for the secondary sexual characters. Meisenheimer is, of course, well aware that the experimental evidence derived from vertebrates seems, *prima facie*, completely at variance with his own results; but he adduces much ingenious argument with the purpose of showing that the "internal secretion" of the testis and ovary, which is certainly a reality, has nevertheless no such specific influence on sex-characters, whether somatic or psychic, as has been supposed. It is, according to him, entirely a matter of enhanced or impeded exchange of material (Stoffwechsel). Metabolism is partially checked by castration, and can be restored by the artificial re-

introduction of generative products, not necessarily of the same species. But this metabolism is not specially concerned with the sex-apparatus or secondary characters, and any effect it may have thereon is incidental and not essential. The author's facts are undoubtedly striking, and his criticisms of adverse views are weighty. But his argument as regards vertebrates is not entirely convincing.

F. A. D.

OUR BOOK SHELF.

Metalography (Printing from Metals). Being a full consideration of the Nature and Properties of Zinc and Aluminium, and their Treatment as Planographic Printing Surfaces. By Charles Harrap. Pp. xvi + 170. (Leicester: Raithby, Lawrence and Co., Ltd. 1909.) Price 3s. net.

THIS treatise professes to be a text-book on the subject of printing from metal plates instead of stone, and is addressed to the lithographic trade. The term "metalography" is a word invented to specify this particular form of printing as distinct from "metallography" as used by metallurgists in a general sense.

Although metal has been in use with more or less success during the past century, it is evident that it is fast coming into more general demand. Zinc was first used, and is still used very largely, but aluminium has more recently been employed as the basis for taking or holding the design to be printed from. The readiness to which either metal lends itself in bending or curving has in turn suggested the manufacture of printing machines of a rotary character, and the result is that there has been a remarkable development in the presses used in producing printed work by the lithographic method.

For some classes of work the stone is still preferred, and probably better results can be obtained from this material in some instances; but if the question of first cost of stone as compared with metal plates is to be studied, the latter are the more economical. Again, the question of space occupied and the great weight of stones for both storage and carriage must be considered. As already indicated, the introduction of metal plates has allowed more scope for the machine-builder, which has quickened and cheapened the output. With the ordinary lithographic stones, which must be printed from the "flat," it was hardly possible that the old forms of presses could be much improved upon.

One other important development has been the introduction of the rotary off-set presses by several manufacturers, which may be used in connection with one or more colours in printing. Either zinc or aluminium plates may be used, and these are fastened round a cylinder, which gives its impression or off-set to another cylinder fitted with a rubber sheet or blanket. The paper to be printed is then conveyed by grippers to a third cylinder, which in motion receives its impression from that which is covered by the rubber.

Very good results are given on cards, or even rough paper, without previous dampening of either material; this obviates the employment of glazed or calendered surfaces, which is a decided advantage. The finished sheets are delivered automatically and the printed face upwards, so that the work can be easily watched in course of production. Such machines as these will produce 1500 or more copies per hour, fed in singly by hand, but the output may be considerably increased by adopting an automatic feeder.

The author has treated the whole subject in a very practical manner, and his long experience as a